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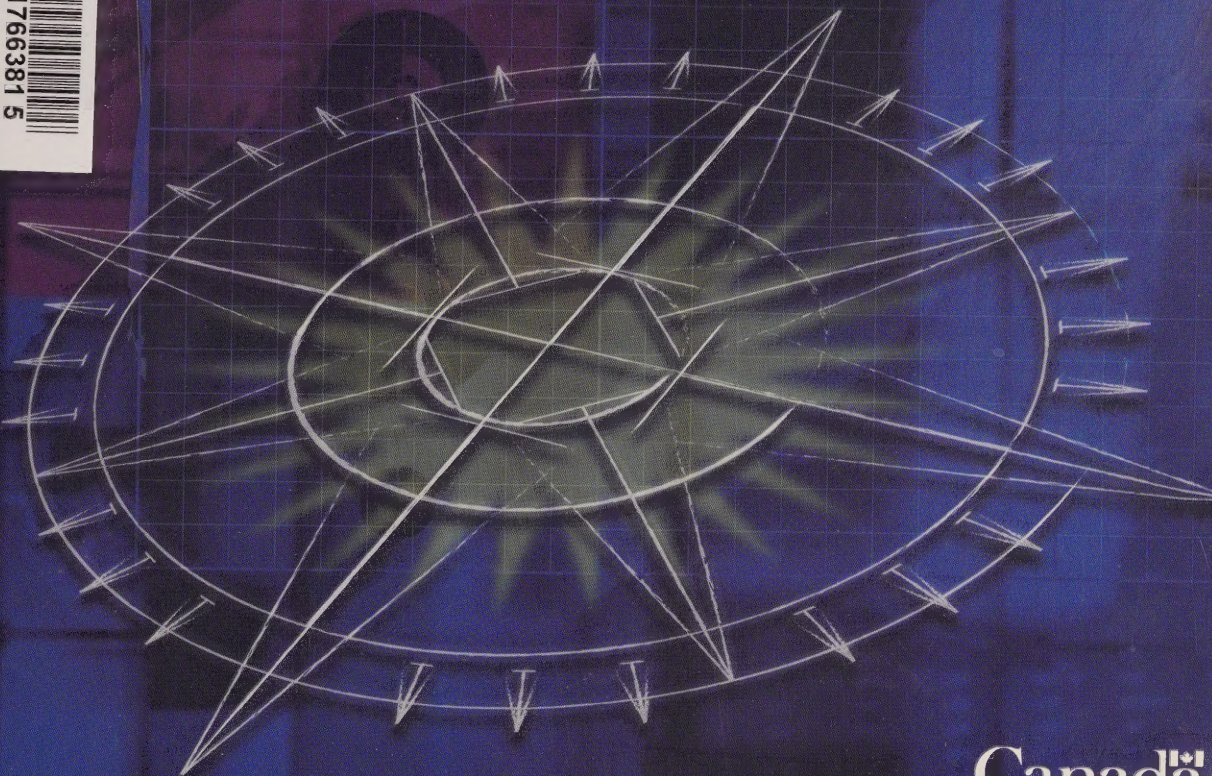
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TECHNOLOGY ROADMAPPING

> A STRATEGY FOR SUCCESS



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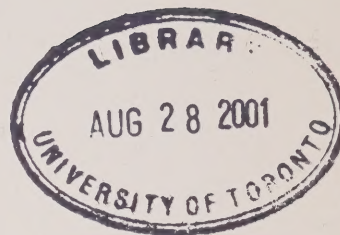


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FOREWORD

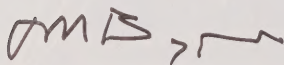
As part of Industry Canada's commitment to innovation, the key to productivity growth, I am pleased to present "A Strategy for Success," an introduction to the *Technology Roadmap (TRM)* initiative.

We at Industry Canada believe strongly that *Technology Roadmaps* are valuable tools for both government and industry. They provide a proven mechanism for Canadian companies to make accurate predictions of future market demands and determine the innovative processes and products required to satisfy them.

To achieve success in today's global economy, companies must be able to produce the right product at an appropriate time. *TRMs* are exceptional analytical and marketing tools with the capacity to chart future market directions, forecast technological developments and help determine the strategic choices that companies need to make. Through this process, *TRMs* provide impetus for research and development, technological innovation and technology transfer.

The formation of dynamic partnerships between public and private sector organizations is another critical element for success in the evolving marketplace. By stimulating dialogue and collecting valuable information, *TRMs* encourage such partnerships and help establish policies and set planning priorities for both industries and government.

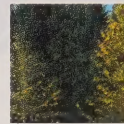
I would like you to investigate for yourself what *TRMs* can do for your organization. Inside this brochure you will find information about the process as well as specific initiatives. I urge you to take the time to learn about a tool that can help your company chart its way into a dynamic future.



J.M. Banigan
ADM, Industry Sector

Companies face tremendous business challenges today. All products, services and operations depend on rapidly changing technologies. Products are becoming more complex. Consumers are becoming more demanding. Product life cycles are shortening, and product time-to-market is shrinking. High-calibre, innovative competition abounds. And the whole world has become our market.

It's no secret that the companies with the greatest productivity and biggest market share know how to forecast, analyze and plan. To be competitive in the future, and ensure their long-term success, companies must focus on their future markets and apply a well-researched technology development strategy. That's where technology roadmapping comes in.



TECHNOLOGY ROADMAPPING...

- *helps an industry predict the market's future technology and product needs*
- *defines the "road" that industry must take to compete successfully in tomorrow's markets*
- *guides technology R&D decisions*
- *increases collaboration, shared knowledge and new partnerships*
- *reduces the risk of costly investment in technology*
- *helps the industry seize future marketing opportunities*

WHAT IS TECHNOLOGY ROADMAPPING?

Technology roadmapping is a planning process that is driven by the projected needs of tomorrow's markets. It helps companies to identify, select and develop technology alternatives to satisfy future service, product or operational needs. It brings together a team of experts to develop a framework for organizing and presenting the information to make the right technology investment decisions. And it provides a way to leverage those investments.

Given a set of needs, technology roadmapping defines the critical requirements and performance targets that must be satisfied by certain time frames if a company is to meet the demands of future markets. It also identifies the technologies

a company should develop to meet those targets. Finally, it provides the information needed to make trade-offs among different technology alternatives.

The concept has gained widespread recognition in U.S. business. The American firm Motorola, for example, has seen tremendous returns on the technology roadmapping it did back in the late 80s. Other ambitious companies have learned from Motorola's success and have made technology roadmapping a central part of their business planning. Canadian companies are now beginning to realize just how powerful this planning tool can be.

Canada's economy will grow dramatically if our industries accelerate their development and marketing of innovative technologies. Although Canada already has an outstanding record of technological development, we need to catch up to the nations — the United States and Japan, for example — that have made inroads far more rapidly into expanding markets. By boosting Canadian innovation, we will improve conditions for investment in Canada, increase Canada's share of global trade and create greater employment for Canadians.

WHY PRODUCE A TECHNOLOGY ROADMAP?

- *Technology and markets are changing more and more rapidly.*
- *Industry needs solutions that address today's pressing needs and tomorrow's market goals.*
- *Many solutions are beyond the ability of individual firms.*
- *Companies want and need new partnerships to support their own technology strategies.*
- *Common needs demand leveraged solutions.*

Industry Canada's technology roadmapping initiative has a single purpose: strengthen Canadian competitiveness by helping our industries identify and develop the innovative technologies they need to succeed in a highly competitive global market. One of the best routes to achieving this purpose is to help Canadian industries use technology roadmapping.

We are bringing qualified representatives of major industries together with other specialists to develop a living roadmap that identifies the challenges of the industry, emerging market requirements, technology gaps and R&D projects that could help Canada carve out its share of future markets. The result? Far-reaching thinking, new opportunities and productive alliances that will benefit an entire Canadian industry sector.

ADVANTAGES TO THE INDUSTRY

No single company or industry has the resources to develop the full spectrum of technologies that future markets will demand. That's why Canada's competitiveness depends on creating a successful alliance of industry members so that together they can focus on cross-cutting technology issues and solutions.

A TOOL THAT PROVIDES CLEAR DIRECTION

Sometimes it is unclear to an industry which technology alternative to pursue, how quickly it is needed, or when an industry should coordinate the development of multiple technologies. At times like these, technology roadmapping is essential.



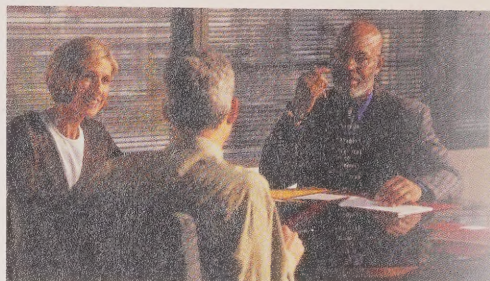
After the roadmap is produced, the participants work together to launch development projects with the aim of producing Canadian technologies that will help them capture future markets. By combining the technological resources and intelligence of several industry partners, these development projects are likely to attain much greater success than one organization could possibly attain on its own. The risks and benefits are shared, and the whole Canadian industry grows stronger.

Industry Canada has seen how roadmapping has helped to drive American technological advances. That's why the department is encouraging Canadian industry to adopt the technique and pick up speed in the global competition for technical innovation and market share.

INDUSTRY CANADA

- *assesses the feasibility of a technology roadmap for a given sector*
- *approaches industry about leading the process*
- *gathers sector-specific information and organizes the process*
- *establishes, with industry, who should participate*
- *coordinates support from government and industry*
- *finds an industry champion to lead the process*
- *provides seed money to cover the expenses for participants*

The department prepares the way for a successful technology roadmap long before industry partners and other experts come on board. We start the process armed with current information on Canadian company capabilities, international market research, technological innovation, emerging market trends, sector-specific productivity statistics as well as human resources and training requirements.



We then determine which sectors of our economy may be at a strategic juncture with regard to new markets, new technologies and new skills requirements. These are the sectors in which roadmapping could be extremely valuable.

Once it becomes clear that a given sector of our economy needs a roadmap and is ready to invest the time and talent, Industry Canada helps to make it happen. We gain the commitment from industry leaders who are well-positioned to lead the process. Collaborating with industry, we then bring together the right minds — industry experts, academics, technology researchers, analysts, economists, educators and government specialists — who will bring insights to the table. While industry representatives lead the process, Industry Canada can help organize and facilitate the meetings, report progress and assist in agenda-setting for next steps. We also inject policy, regulatory and other industry-specific information that could influence the direction of the roadmap. And we bring important information back to policy makers and to R&D funding organizations about how government can encourage greater innovation in Canadian industry.

A SNAPSHOT OF THE PROCESS

Creating a technology roadmap is a collaborative, iterative process.

Although the planning horizon for a technology roadmap differs from sector to sector, the steps for technology roadmapping remain the same.

Phase I

- identify the markets and needs that will fuel the industry's growth in the next three to ten years
- identify the critical technologies required to produce the goods and services demanded by these future markets
- recommend actions to ensure that the Canadian industry in question is prepared to meet the future market demands
- present this information in a "roadmap"

IT STARTS WITH NEEDS, NOT SOLUTIONS

Technology roadmapping is driven by needs. For example, the whole world needs to reduce pollution and the consumption of fossil fuels. Part of the solution might be to invent vehicles that go farther on less fuel. Or that run on renewable, non-polluting fuels. Technology roadmapping provides a way to identify, evaluate and select technology alternatives to satisfy defined needs.

Phase II

- define the actions required to develop and commercialize the critical technologies forecasted in phase I
- identify the technology development projects that have the best potential for leading the industry to a strong position in future markets
- identify the R&D funding and partnerships required to launch the projects

Phase III

- review and update the technology roadmap periodically as markets and technologies evolve

By phase III, industry partners have adopted technology roadmapping as a standard business planning tool. By keeping their roadmaps "ever green," companies remain focused on future markets and the technological innovation that will help them compete and win.



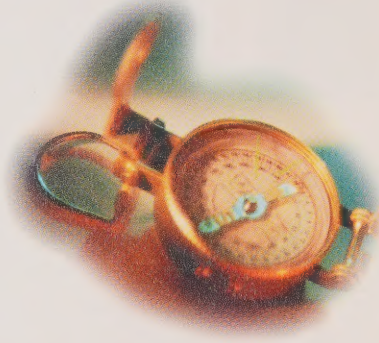
ROADMAPS AND RESULTS: CANADIAN SUCCESSES

Since Industry Canada launched this initiative in 1996, several Canadian industries are now well on their way to reaping the benefits. These industries have been working closely with the department to rethink their place in future markets and develop a comprehensive technology roadmap.

- Aircraft Design and Manufacturing; Aluminum; Canadian Electric Power; Canadian Metalcasting; Forestry Operations; Geomatics; Lumber and Value-Added Products; and Wood-Based Panel Products now have technology roadmaps to guide their decisions.
- The private sector is currently leading technology roadmapping for Biopharmaceuticals; Intelligent Buildings; Medical Imaging; and Photonics.
- Over fifty non-industry partners — universities, government departments, research institutes and associations — have collaborated with approximately 400 industry partners representing 200 companies to produce technology roadmaps and launch development projects.

- The Natural Sciences and Engineering Research Council (NSERC) and the Social Sciences and Humanities Research Council (SSHRC), as well as Natural Resources Canada can use technology roadmaps to help identify and fund research through the Research Partnerships Program (\$2.4 million).

Thanks to a new strategic direction and strong partnerships, the industries that have a technology roadmap are moving to the next stage: joint technological initiatives that will prepare them to deliver what tomorrow's markets will demand.



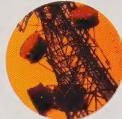
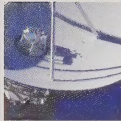
SOLUTIONS FOR SUCCESS

Technology roadmapping helps companies and R&D organizations to think strategically, decide intelligently and collaborate strongly to deliver the critical solutions they need to succeed in tomorrow's markets.



A CALL TO ACTION

Canada can't afford to lag behind our major competitors in a world where competition is so fierce. We have the talent and the resources to generate the technologies that will be essential to our nation's future productivity. But we need to work more cohesively within each sector of our economy, pooling resources and risks to develop the technologies that will make the competitive difference. Industry Canada is ready to help your sector of our national economy develop your technology roadmap.



To find out how to get started, call Geoff Nimmo,
Technology Roadmap Coordinator, Industry Canada, at
(613) 954-3040.

Or reach him by email at nimmo.geoffrey@ic.gc.ca. You will
also find information about technology roadmapping on
Strategis, Industry Canada's Web site, at
<http://strategis.ic.gc.ca/trm>.

THE REST IS UP TO YOU

